

Appl. No. 10/088,725
Amdt. dated 28 Oct 2003
Reply to Office action of 30 May 2003

Attorney Docket No. 57.0359 US PCT

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This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method for updating an earth model comprising the steps of:

obtaining an earth model used for predicting potential problems in drilling of a borehole having a predetermined trajectory, the earth model comprising a plurality of components;

~~predicting one or more conditions under which the borehole will fail based on the earth model~~
~~obtaining evaluations of the state of the borehole and local geological features, the evaluations being based on the earth model;~~

receiving data gathered during the construction of the borehole;

comparing the ~~predicted failure conditions~~ ~~evaluations~~ with a diagnosis of the ~~state of the borehole and local geological features~~ to identify at least one inconsistency, the diagnosis being based on the received data;

selecting a component of the earth model that is related to the identified inconsistency and has a high degree of uncertainty; and

updating the selected component of the earth model prior to completing construction of the borehole using the received data.

2. (cancelled).

3. (currently amended) The method of claim 2-1 wherein the predictions are obtained by combining the earth model with the predetermined trajectory of the borehole.

4. (currently amended) The method of claim 3 further comprising repeating the steps of ~~combining~~ ~~predicting~~, comparing, selecting and updating until a sufficient match exists between the predicted failure conditions and the diagnoses of the borehole.

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5. (currently amended) The method of claim 4 wherein the step of ~~combining~~predicting when repeated uses the updated component of the earth model, and the step of selecting when being repeated, considers components that have been recently updated as having a lower degree of uncertainty.

6. (original) The method of claim 1 wherein the step of selecting a component comprises:

identifying components of the earth model that are relevant to the identified inconsistency; and
ranking the identified components according to the degree of uncertainty.

7. (original) The method of claim 1 wherein the selected component is the component having the highest degree of uncertainty of the components that are related to the identified inconsistency.

8. (original) The method of claim 1 wherein the step of updating comprises effecting the minimum practical changes to the selected component that eliminates an identified inconsistency.

9. (original) The method of claim 1 wherein the received data includes the effective density of the drilling fluid used in the construction of the borehole and one at least other parameter, and the step of updating comprises updating the selected component using the effective density and the at least one other parameter.

10. (original) The method of claim 1 wherein the diagnosis of the borehole is generated by extensive use of real-time MWD and LWD measurements.

11. (original) The method of claim 1 wherein the step of obtaining an earth model includes generating the earth model.

12. (withdrawn) A method for drilling a borehole using an earth model comprising the steps of:

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obtaining an earth model used for predicting potential problems in drilling of a borehole having a predetermined trajectory comprising a plurality of components;
predicting one or more conditions under which the borehole will fail based on the earth model and the predetermined trajectory;
drilling part of the borehole substantially according to the predetermined trajectory;
receiving data gathered during the construction of the borehole;
comparing the predicted failure conditions with a diagnoses of the borehole based on the received data to identify at least one inconsistency;
selecting a component of the earth model that is related to the identified inconsistency and has a high degree of uncertainty;
updating the selected component of the earth model prior to completion of the borehole using the received data; and
thereafter drilling a further portion of the borehole using the earth model including the updated component.

13. (withdrawn) The method of claim 12 further comprising repeating the steps of predicting, comparing, selecting and updating until a sufficient match exists between the predicted failure conditions and the diagnoses of the borehole.

14. (withdrawn) The method of claim 13 wherein the step of combining when repeated uses the updated component of the earth model, and the step of selecting when being repeated, considers components that have been recently updated as having a lower degree of uncertainty.

15. (withdrawn) The method of claim 12 wherein the step of selecting a component comprises:

identifying components of the earth model that are relevant to the identified inconsistency; and
ranking the identified components according to the degree of uncertainty.

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16. (withdrawn) The method of claim 12 wherein the step of updating comprises effecting the minimum practical changes to the selected component that eliminates an identified inconsistency.

17. (withdrawn) The method of claim 12 wherein the received data includes the effective density of the drilling fluid used in the construction of the borehole and one at least other parameter, and the step of updating comprises updating the selected component using the effective density and the at least one other parameter.

18. (currently amended) A computer readable medium that is capable of causing a computer to perform steps comprising:

obtaining an earth model used for predicting potential problems in drilling of a borehole having a predetermined trajectory, the earth model comprising a number of components;

predicting one or more conditions under which the borehole will fail based on the earth model~~obtaining evaluations of the state of the borehole and local geological features, the evaluations being based on the earth model;~~

receiving data gathered during the construction of the borehole;

comparing the predicted failure condition~~evaluations~~ with a diagnosis of ~~the state of the borehole and local geological features~~ to identify at least one inconsistency, the diagnosis being based on the received data;

selecting a component of the earth model that is related to the identified inconsistency and has a high degree of uncertainty; and

updating the selected component of the earth model prior to completing construction of the borehole using the received data.

19. (original) The computer readable medium of claim 18 capable of causing a computer to perform steps further comprising:

identifying components of the earth model that are relevant to the identified inconsistency; and

ranking the identified components according to the degree of uncertainty.

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20. (original) The computer readable medium of claim 19 wherein the step of updating comprises effecting the minimum practical changes to the selected component that eliminates an identified inconsistency.

21. (original) The computer readable medium of claim 20 wherein the received data includes the effective density of the drilling fluid used in the construction of the borehole and one at least other parameter, and the step of updating comprises updating the selected component using the effective density and the at least one other parameter.

22. (new) The method of claim 1 further comprising the step of thereafter drilling a portion of the borehole using the earth model including the updated component.